

Paper No. ____

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WESTERN DIGITAL TECHNOLOGIES, INC.,
Petitioner,

v.

GODO KAISHA IP BRIDGE 1,
Patent Owner.

Case No. IPR2024-01447
Patent No. 8,405,134

PATENT OWNER'S SUR-REPLY TO PETITIONER'S REPLY

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LISTING OF EXHIBITS

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2001	Kittel, C., <i>Introduction to Solid State Physics</i> , 6th Edition, 1986, pgs. 13-15, 18, 23 (“Kittel”)
2002	Duke, C.B., <i>Tunneling in Solids</i> , Solid State Physics: Advances in Research and Applications, 1969, pgs. 1, 6-7, 34-35, 78-79 (“Duke”)
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2005	Zhu, J.G., et al., “Review Feature: Magnetic tunnel junctions,” <i>Materials Today</i> , vol. 9, no. 11, 2006, pp. 36-45 (“Zhu”)
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2007	Yuasa, S., et al., “High Tunnel Magnetoresistance at Room Temperature in Fully Epitaxial Fe/MgO/Fe Tunnel Junctions due to Coherent Spin-Polarized Tunneling,” <i>Japanese Journal of Applied Physics</i> , vol. 43, no. 4B, 2004, p. L588 (“JJAP”)
2008	Yuasa, S., et al., “Giant room-temperature magnetoresistance in single crystal Fe/MgO/Fe magnetic tunnel junctions,” <i>Nature Materials</i> , vol. 3, no. 12, 2004, pp. 868-871 (“Nature”)
2009	Callister, W.D., <i>Fundamentals of Materials Science and Engineering, An Integrated Approach</i> , Department of Metallurgical Engineering, The University of Utah, Second Edition, 2005, pgs. 36-37, G1 (“Callister”)
2010	U.S. Patent No. 6,590,803 to Saito et al. (“the ’803 Patent”)
2011	U.S. Patent Application Publication No. 2002/0036877 to Sakakima, et al. (“Sakakima”)

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2013	S. Yuasa et al. “Characterization of growth and crystallization processes in CoFeB / MgO / CoFeB magnetic tunnel junction structure by reflective high-energy electron diffraction,” <i>Applied Physics Letters</i> , vol. 87, no. 24, p. 242503, 2005.
2014	Definitions of “crystalline” and “crystallize,” Webster’s Encyclopedic Unabridged Dictionary of the English Language (1989)
2015	Definitions of “anneal”, “crystalline” and “crystallized,” Webster’s Ninth New Collegiate Dictionary (1984)
2016	Gleiter, H. “Nanostructured Materials: Basic Concepts and Microstructure,” <i>Acta Materialia</i> , vol. 48, no. 1, pp. 1-29 (2000)
2017	Deposition of Jeffrey Bokor, Ph.D. (June 24, 2025) (“Bokor-Depo2”)
2018	Deposition of Jeffrey Bokor, Ph.D. (June 25, 2025) (“Bokor-Depo”)
2019	Marrows, C.H. “Spin-polarised currents and magnetic domain walls,” <i>Advances in Physics</i> , vol. 52, no. 8, 2005, pp. 585-713
2020	Tsymbal, E., et al., <i>Handbook of Spin Transport and Magnetism</i> , 2012
2021	RESERVED
2022	Nakatani, T., et al. “Read sensor technology for ultrahigh density magnetic recording,” <i>MRS Bulletin, Materials Research Society</i> , vol. 43, no. 2, 2018, pp. 106-111
2023	Jiang, B., et al. “Tunneling magnetoresistive devices as read heads in hard disk drives,” <i>Journal of Magnetism and Magnetic Materials</i> , vol. 571, 2023, p. 170546
2024	The 23rd (FY2022) Japan Society of Applied Physics Achievement Award Recipients (with English translation), The Japan Society of Applied Physics, <i>available at</i> https://www.jsap.or.jp/outstanding-achievementaward/recipients/recipients23

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2025	RESERVED
2026	2021 New Fellows, IEEE Japan Council, <i>available at</i> https://ieeelp.org/en/kaiin/fellow/fellow21.html
2027	JST owned patent wins Future Creative Invention Prize at the National Invention Award 2021, Japan Science and Technology Agency, <i>available at</i> https://www.jst.go.jp/report/2021/210525_e.html
2028	Dr. Shinji Yuasa profile, <i>available at</i> https://www.jst.go.jp/impact/sahashi/en/system/index.html
2029	AIST wins three Science and Technology Awards in the 2016 Minister of Education, Culture, Sports, Science and Technology Commendation for Science and Technology, <i>available at</i> https://www.aist.go.jp/aist_j/news/prize/pr20160412_3.html
2030	Yuasa, S., “IEEE Magnetics Society Distinguished Lecturers for 2012: Magnetoresistance and Spin-Transfer Torque in Magnetic Tunnel Junctions,” <i>IEEE Transactions on Magnetics</i> , vol. 48, no. 1, 2012, p.3
2031	Shinji Yuasa – IEEE Magnetics Society, <i>available at</i> https://ieeemagnetics.org/contact/shinji-yuasa#biography
2032	AIST, “Winner of the 20th Tsukuba Award,” <i>available at</i> https://www.aist.go.jp/aist_j/news/prize/itemid025-000077.html
2033	Announcing the winners for “Tsukuba Prize,” “Esaki Leona Prize,” and “Tsukuba Encouragement Prize”: Ibaraki Prefectural Science and Technology Promotion Foundation (with English translation), <i>available at</i> https://www.tsukuba-sci.com/cms/?p=9853
2034	AIST: 34th Inoue Harunari Prize, <i>available at</i> https://www.aist.go.jp/aist_j/news/prize/itemid025-000082.html

Exhibit	Description
2035	Technological seeds that overcome the valley of death (Shinji Yuasa/Head of the Spintronics Group, National Institute of Advanced Industrial Science and Technology), <i>available at</i> https://scienceportal.jst.go.jp/explore/highlight/20090717_01/
2036-2037	RESERVED
2038	Maat, S., et al., <i>Physics and Design of Hard Disk Drive Magnetic Recording Read Heads</i> , Handbook of Spintronics, 2014
2039	Butler, et al., <i>Magnetic Memory A signal boost is in order</i> , Nature Materials, Nature Publishing Group, Vol. 3, December 2004, pp. 845-847
2040-2047	RESERVED
2048	M. Ohring, <i>The Materials Science of Thin Films</i> , Academic Press (1992).
2049-2051	RESERVED
2052	Citations to EX2006, <i>available at</i> https://scholar.google.com/citations?view_op=view_citation&hl=en&user=kb5EQcsAAAAJ&citation_for_view=kb5EQcsAAAAJ:kNdYIx-mwKoC
2053	Declaration of Caroline Ross, Ph.D.
2054	CV of Dr. Caroline Ross, Ph.D.
2055	Japanese Patent No. JP 5120680 B2 with certified English translation
2056	File History of U.S. Patent Application No. 10/824835 (EX1092 in <i>Western Digital v. IP Bridge</i> , IPR2025-00701)

Exhibit	Description
2057	Citations to EX2008, <i>available at</i> https://scholar.google.com/citations?view_op=view_citation&hl=en&user=kb5EQcsAAAAJ&citation_for_view=kb5EQcsAAAAJ:3fE2CSJlr18C
2058	Powder diffraction file for Au, from Joint Committee of Powder Diffraction Standards (JCPDS), The International Centre for Diffraction Data, icdd.com
2059	Excerpt of Deposition Transcript of Dr. Jeffrey Bokor, <i>Qualcomm Inc. v. Monterey Research, LLC</i> , IPR2021-00125, EX1020 (November 19, 2021).
2060	Parkin, S.P, <i>et al.</i> , “Giant tunneling magnetoresistance at room temperature with MgO (100) tunnel barriers,” <i>Nature Materials</i> , 3 (2004), 862-867
2061	Boubeta, <i>et al.</i> , “Epitaxial Fe/MgO heterostructures on GaAs(001),” 226 <i>J. of Crystal Growth</i> 223-230 (2001); Exhibit EX1084 in IPR2024-01493
2062	Saito, Y., et al., “Correlation between barrier width, barrier height, and dc bias voltage dependences on the magnetoresistance ratio in Ir-Mn exchange biased single and double tunnel junctions,” <i>Jpn J. Appl. Phys.</i> 39, L1035–L1038 (2000)
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2066	Krikorian, E., et al., “Nucleation, Growth and Transformation of Amorphous and Crystalline Solids Condensing From the Gas Phase,” <i>Astrophysics and Space Science</i> 65, 129-154 (1979)

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2067	Aboelfotoh, M. O., <i>Crystal Structure of Evaporated MgO Films on Amorphous and Polycrystalline Substrates</i> , Journal of Vacuum Science and Technology, Vol. 10, No. 5, 621-625 (1973)
2068	Aboelfotoh, M. O., <i>Preferred orientations in MgO films deposited on amorphous substrates</i> , Applied Physics Letters, Vol. 24, No. 8, 347-349 (1974)
2069	L.E. Murr, <i>Handbook of Materials Structures, Properties, Processing and Performance</i> , Springer, 2015, pgs. 149-161
2070	Errata to EX2017 - Deposition of Jeffrey Bokor, Ph.D. (June 24, 2025)
2071	Errata to EX2018 - Deposition of Jeffrey Bokor, Ph.D. (June 25, 2025)
2072	EX2024 - The 23rd (FY2022) Japan Society of Applied Physics Achievement Award Recipients (with English translation), The Japan Society of Applied Physics, https://www.jsap.or.jp/outstanding-achievementaward/recipients/recipients23 with Amended Certification of Translation [SUPPLEMENTAL EVIDENCE - NOT FILED]
2073	Certified English Translation of EX2029 - AIST wins three Science and Technology Awards in the 2016 Minister of Education, Culture, Sports, Science and Technology Commendation for Science and Technology, <i>available at</i> https://www.aist.go.jp/aist_j/news/prize/pr20160412_3.html [SUPPLEMENTAL EVIDENCE - NOT FILED]
2074	Certified English Translation of EX2032 - AIST, “Winner of the 20th Tsukuba Award,” <i>available at</i> https://www.aist.go.jp/aist_j/news/prize/itemid025-000077.html [SUPPLEMENTAL EVIDENCE - NOT FILED]
2075	Certified English Translation of EX2034 - AIST: 34th Inoue Harunari Prize, <i>available at</i> https://www.aist.go.jp/aist_j/news/prize/itemid025-000082.html [SUPPLEMENTAL EVIDENCE - NOT FILED]

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2076	Certified English Translation of EX2035 - Technological seeds that overcome the valley of death (Shinji Yuasa/Head of the Spintronics Group, National Institute of Advanced Industrial Science and Technology), <i>available at</i> https://scienceportal.jst.go.jp/explore/highlight/20090717_01/ [SUPPLEMENTAL EVIDENCE - NOT FILED]
2077	Declaration of Caroline Ross, Ph.D. [SUPPLEMENTAL EVIDENCE - NOT FILED]
2078	Declaration of Dara Del Rosario [SUPPLEMENTAL EVIDENCE - NOT FILED]
2079	Transcript of October 29, 2025 Board Conference Call
2080	U.S. Patent Application Ser. No. 10/824,835 [cited as deposition EX2079 in EX2085, Deposition of Jeffrey Bokor, Ph.D. (Oct. 30, 2025)]
2081	U.S. Patent Application Ser. No. 10/646,246
2082	Reserved
2083	Reserved
2084	Reserved
2085	Transcript of Deposition of Jeffrey Bokor, Ph.D. (Oct. 30, 2025)
2086	Transcript of Deposition of Jeffrey Bokor, Ph.D. (Oct. 31, 2025)
2087	Reserved
2088	Errata to EX2085 - Deposition of Jeffrey Bokor, Ph.D. (Oct. 30, 2025)
2089	Errata to EX2086 - Deposition of Jeffrey Bokor, Ph.D. (Oct. 31, 2025)

I. Introduction

The Petition misunderstood that MgO barriers being crystalline(001) in Bowen and Nagahama – where MgO barriers form on templating crystalline(001) electrodes – does not mean MgO(001) barriers would form on amorphous CoFeB electrodes in Petitioner’s *combinations*.

Ground 1 has a single conclusory sentence alleging that Bowen’s MgO barrier would “still” be MgO(001) if Bowen’s Fe lower electrode was replaced with amorphous CoFeB, but never explains why POSAs would have expected that to happen. Petition, 33-34. It is undisputed that Bowen’s MgO barrier is crystalline(001) because it forms on a templating *crystalline(001)* Fe electrode that Ground 1’s combination *replaces with amorphous* CoFeB. The Petition made no argument and cited no evidence establishing a reasonable expectation of success that Ground 1’s combination would achieve an MgO(001) barrier on *amorphous CoFeB*.

Ground 2 mapped the MgO(001) barrier limitations to *unmodified* Nagahama. It is undisputed that Nagahama formed its MgO(001) barrier on a crystalline(001) Fe electrode that Ground 2’s combination replaces with amorphous CoFeB. Petition, 56-57. The Petition made no argument and cited no evidence establishing that an MgO(001) barrier would form in Ground 2’s combination on amorphous CoFeB.

The ***Petition***'s failure to establish a reasonable expectation of success should end the matter. That was required to establish *prima facie* obviousness and cannot be remedied in Reply.

The Reply does not meaningfully defend the Petition's failed showing. Instead, the Reply advances new arguments, based on new evidence, in a belated attempt to establish *prima facie* obviousness. The Reply's arguments that (1) Parkin discloses MgO(001) formed on amorphous CoFeB and (2) prior art allegedly disclosing MgO(001) on ***different*** amorphous substrates was predictive of MgO(001) formation on amorphous CoFeB, so (3) POSAs reasonably expected success in forming an MgO(001) barrier on amorphous CoFeB are the subject of a Motion to Strike (Paper 31). These arguments should not be considered and fail if considered.

Petitioner's expert Bokor admitted that his assertion that the prior art taught forming an MgO(001) barrier on amorphous CoFeB rests on Parkin Fig. 11 – he could find no other teaching. *Infra* §V.B.3. But Parkin says Fig. 11's MgO(001) was formed by “methods” in incorporated applications (Parkin, 23:6-11, 19:1-6) that Parkin explains form MgO(001) on a ***crystalline(001) layer*** – not on amorphous CoFeB (*id.*, 3:24-41). Petitioner and Bokor ignored this disclosure and are wrong about Parkin Fig. 11. ***No prior art reference taught forming MgO(001) on amorphous CoFeB.***

The Reply resorts to new evidence purportedly showing MgO(001) formed on *different* amorphous substrates. Reply, 5-9. No prior art reference supports Petitioner’s assertion that POSAs would have considered this informative of whether an MgO(001) barrier would form on amorphous **CoFeB**. All Petitioner has is Bokor’s naked say-so. But Bokor’s testimony is not credible because he admitted he is “*no expert*” in crystal growth. EX2018, 77:9-78:3.¹ He admitted crystal growth is very complicated and that he did not evaluate, or even understand, many relevant considerations. *Infra* §§V.A, V.D.1. Patent Owner (“IPB”)’s expert Ross *is* a crystal formation expert and explained that given the complexities of crystal formation on CoFeB, POSAs would not have considered teachings for different amorphous substrates to be informative. *Infra* §V.D.1. Her testimony is corroborated by extensive evidence, including objective evidence praising the inventor’s surprising results. *Infra* §§V.D.3, VI.

No credible evidence supports Petitioner’s belated assertion that POSAs would have reasonably expected success in forming an MgO(001) barrier on amorphous CoFeB; the evidence is overwhelmingly to the contrary. That is fatal to both grounds.

¹ All emphasis added unless otherwise noted.

II. Petitioner's Obfuscation Fails

IPB is not asking “the Board to scrap” Bowen’s, Nagahama’s and Parkin’s “MgO(001)/(100)” teachings. Reply, 1. Petitioner never refutes that these references formed MgO(001) on a crystalline(001) layer that acted as a template for MgO(001) formation. POR, 9-10, 44-46. Petitioner never disputes that its combinations replace Bowen’s/Nagahama’s crystalline(001) layers on which MgO(001) was formed with ***non-crystalline*** (amorphous) CoFeB, nor that the Petition ignored the impact this would have been expected to have on whether MgO(001) would form in Petitioner’s ***combinations***. POR, 27-43. The Reply’s allegation that MgO(001) was known to form on amorphous CoFeB is an improper new argument that should not be considered. If considered, it fails because it is unsupported by evidence. *Infra* §§V-VI.

Petitioner never identifies a “disclaimer” or “abandonment” relevant to the claims at issue here because there are none. Reply, 1. Petitioner’s reliance on IPR2025-00701 (*id.*) is stunning given the Board’s denial of institution on the merits.

III. The ‘134 Patent Describes How MgO(001) Is Formed on CoFeB

Petitioner’s assertion that the ‘134 Patent “provides nothing on how to fabricate MgO(001) on an amorphous layer” (Reply, 10) is false. *See e.g.*, EX1005, 8:27-9:10 (modifying an embodiment in which MgO is not epitaxially grown to

use CoFeB electrodes and “an anneal process after preparation of the MTJ device” which yielded Fig. 11’s MTJ with MgO(001) and crystallized CoFeB); EX2023, 2 (praising Yuasa’s “novel idea[]” that formed MgO on “CoFeB amorphous” and showed that “[u]pon annealing CoFeB and MgO can be crystallized to BCC structures.”).

IV. The Reply Never Refutes the Petition’s Failure to Establish a Reasonable Expectation of Success in Meeting the MgO(001) Limitations

Every claim requires an MgO(001) barrier. *See* Limitations 1[d] and 3[d] (the “MgO(001) limitations”).

A. Ground 2

Petitioner never disputes that the Petition mapped the MgO(001) limitations to *Nagahama unmodified* by Sunai and/or Parkin, that Nagahama formed its MgO barrier on a crystalline(001) electrode, and that the Petition never alleged, let alone cited evidence establishing, that POSAs would have reasonably expected MgO(001) to form in Ground 2’s combination that replaces Nagahama’s crystalline(001) electrode with amorphous CoFeB. Petition, 56; POR, 19-21.

The Reply misapplies the law (*infra* § IV.C), seeks to burden shift, and advances improper new arguments. Reply, 12-13. IPB carries no burden to show that POSAs would have expected the combination’s MgO barrier “to *not* have an

(001) orientation.” Reply, 12 (emphasis original).² To establish *prima facie* obviousness, the Petition needed to provide argument and *evidence* explaining how and why POSAs *would* have reasonably expected the *combination’s* MgO barrier to be (001). The Petition’s failure to do so is fatal to Ground 2.

B. Ground 1

The Reply never disputed that:

- Ground 1 cited unmodified Bowen to teach MgO(001) and had a single conclusory sentence alleging that “if ... CoFeB electrodes are used... [POSAs] would understand that the MgO ... would still have the same (001) orientation” (Petition, 33-34 (*citing* EX1024, ¶129; Parkin, 9:58-10:2, 18:49-51; ‘134 Patent (EX1005)));
- “[n]one of the *cited evidence* supports ... that a POSA ‘would understand that the MgO ... would still have the same (001) orientation’” (POR, 22-27);
 - Petitioner cited the ‘134 Patent only to establish the undisputed fact that Parkin’s (100)-orientation is the same as the claimed (001)-orientation (POR, 23);

² The Reply’s new arguments (Reply, 12) do not “debunk[]” this – they fail if considered (*infra* §V.D).

- Bokor’s testimony (EX1024, ¶129) warrants no weight because it merely parrots the Petition’s conclusory assertion (POR, 25);
- Parkin, 18:49-51 describes MgO(001) but says nothing about how it is formed (POR, 23); and
- Parkin, 9:58-10:2 explains that a crystalline(001) layer is used to promote MgO(001) formation which does **not** support the Petition’s assertion that POSAs would have expected MgO to “still” be (001) in Ground 1’s combination that **eliminates** Bowen’s crystalline(001) layer (POR, 23-25).

As discussed *infra* §V.B.3, the Reply cites **different** Parkin disclosure (e.g., Fig. 11’s interface layer 520) to advance the **different** argument that Parkin allegedly teaches “forming an MgO(001) tunnel over an **amorphous CoFeB** layer.” Reply, 5. That is improper. *Ariosa v. Verinata*, 805 F.3d 1359, 1367 (Fed. Cir. 2015) (affirming Board’s refusal to consider Reply arguments relying “on previously unidentified portions of a prior-art reference to make a meaningfully distinct contention”).

C. Petitioner Misapplies the Law

Establishing obviousness does not require bodily incorporation. Reply, 11-12. But it **does** require that Petitioner explain its combinations’ contemplated workings as a “prerequisite to adequately explaining and supporting a conclusion

that [POSAs] would have ... reasonably expected success” in making the combinations. POR, 18 (citing *Personal Web*). That a “brief explanation” may suffice “***if*** ... the technology is simple and familiar and the prior art is clear” does not help Petitioner. Reply, 13. The Petition has **no** explanation of how or why MgO(001) would form in either ground’s combination – not a brief one – and the technology is not remotely “simple.” EX2085, 178:13-179:3, 201:12-202:5 (Bokor admitting crystal growth is “very complicated”); 156:23-157:8, 185:8-186:15 (Bokor admitting he did not even understand parameters impacting crystal formation).

Petitioner concedes “blind adherence to Bowen’s/Nagahama’s fabrication steps” would not yield MgO(001) (Reply, 11-12) and disavows annealing—which Yuasa used (*infra* §III)—as the basis for its alleged reasonable expectation of success showing. Reply, 16 (“annealing is irrelevant to finding the prior art taught or suggested Claim 1[d]/3[d]”). That the expectation of success showing need not be “absolute” is immaterial because the Petition made **no** showing. Reply, 13. The Petition never argued, and cited no evidence establishing, that POSAs would have reasonably expected Petitioner’s combinations to yield MgO(001) on amorphous CoFeB.

D. Petitioner Should Be Held to the Petition's Failed Arguments

Petitioner must make its case “with particularity” *in the Petition*. 35 U.S.C. §312; 37 C.F.R. §42.22. The Petition never addressed the impact that eliminating Bowen's/Nagahama's crystalline(001) layer would have on a POSA's expectation of whether MgO(001) would form in Petitioner's *combinations*. That is stunning given the evidence that POSAs would *not* have expected MgO(001) to form on CoFeB. POR, 60-71; *infra* §VI.

The Board should hold Petitioner to the *Petition's* arguments and find that the Petition failed to establish a reasonable expectation of success for either ground in meeting the MgO(001) limitations.

V. The Reply's New Arguments Fail if Considered

The Reply argues, based on new evidence, that: (1) Parkin discloses MgO(001) formed on amorphous CoFeB (Reply, 2-5) and (2) MgO(001) allegedly forming on *different* amorphous substrates gave POSAs a reasonable expectation of success in forming an MgO(001) barrier on amorphous CoFeB (*id.*, 5-9, 12-13). The Petition never made these arguments so they should not be considered and they fail if considered.

A. Petitioner's New Arguments Hinge on Unreliable Bokor Testimony

Bokor admitted that evaluating whether MgO(001) would have been expected to form on amorphous CoFeB involves “very complicated” crystal

growth dynamics. EX2085, 178:5-179:3, 201:12-202.7. Yet, Bokor admitted “*I’m no expert. I’m no crystal grower.*” EX2018, 77:9-78:3; *see also* EX2059, 42:6-21 (“I’m not a material scientist ... at best I’m an *amateur* consumer of material science”). Bokor is not qualified to offer the testimony he offered.

Even if not excluded, Bokor’s testimony warrants no weight because he lacks the requisite expertise, his testimony is conclusory, and it is refuted by objective evidence and by Ross – who Petitioner never disputes is a world-leading crystal growth expert. POR, 1. Petitioner cannot carry its burden because it lacks credible expert testimony in this indisputably “very complicated” area. EX2085, 178:13-179:3, 201:12-202.7; *Wyers v. Master Lock*, 616 F.3d 1231, 1240 n.5 (Fed. Cir. 2010) (“expert testimony [] is sometimes essential, particularly in cases involving complex technology”).

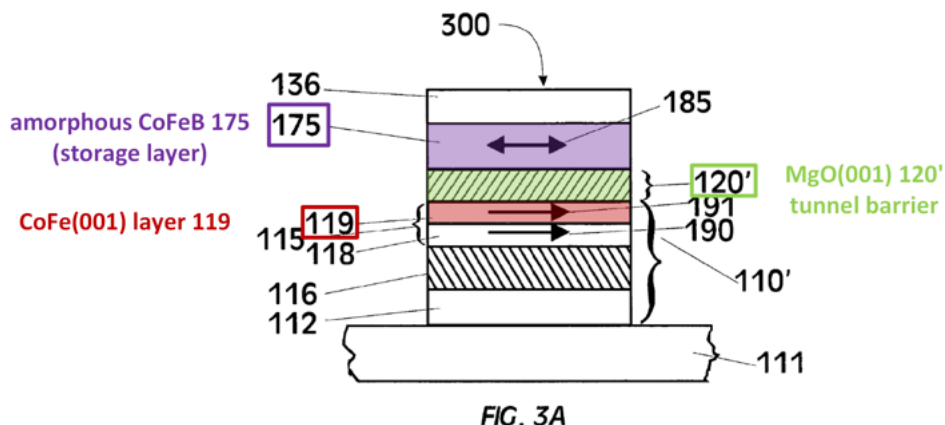
B. Parkin Does Not Form MgO(001) on Amorphous CoFeB

Alleging Parkin discloses MgO(100) “atop” amorphous CoFeB is obfuscation. Reply, 1-2. Parkin’s MgO(001) layers are formed *on* a crystalline(001) layer. Petitioner’s Ground 1-2 combinations indisputably form MgO *on* CoFeB. POR, 19-27. Parkin does not disclose that.

1. Fig. 3A’s MgO(001) Forms On a Crystalline(001) Layer

MgO(100) layer 120' forms on **crystalline CoFe(001) layer 119** consistent with well-known teachings that a crystalline(001) layer promotes MgO(001).

EX1062, 9:58-10:2, 13:10-25, 17:11-39, Fig. 3A (annotated below); POR, 9-10;
EX2053 ¶¶104-108.



“**MgO tunnel barrier 120'**” is formed on “electrode 110' using the method [in] application [] 10/824,835” (“’835-Application”). Parkin, 17:21-29. Parkin incorporates the ’835-Application by reference and correctly characterizes it as forming **MgO** on a crystalline(001) layer. Parkin, 3:24-37 (“on a ferromagnetic electrode comprised of a **Co—Fe alloy**, which is **bcc and (100) textured**”); EX2053, ¶¶104-105; EX2080 (’835-Application), 26:5-19, 58:1-5, 25:8-10, 24:21-25:1, 27:10-18, 35:10-18, 45:19-46:12. Bokor admitted this. EX2085³, 55:1-56:15, 63:20-64:6, 65:21-68:7, 57:12-60:24, 68:18-70:19, 75:2-16, 97:16-98:1, 103:14-107:2.

Petitioner never disputes Parkin achieved Fig. 3A’s MgO(001) by forming it on a crystalline(001) layer. POR, 9-10.

³ EX2080 cited as EX2079 in EX2085.

2. “Inverted” Fig. 3A Does Not Disclose MgO(001) on Amorphous CoFeB

Parkin and *both experts* refute Petitioner’s suggestion that *Parkin*’s “inverted” Fig. 3A (EX1062, 17:7-8) discloses MgO(001) formed on amorphous CoFeB (Reply, 2-5, 14, 21).

Fig. 3A’s MTJ has “reference” electrode 115 (fixed polarization) beneath, and “storage” electrode 175 (variable polarization) above, the MgO barrier. *Parkin*, 16:47-17:7. “Inverted” means inverting the reference/storage positions so the storage electrode is beneath the MgO barrier. EX1062, 17:7-8; EX1101, 157:5-9. Petitioner’s suggestion that *Parkin* says the storage electrode would remain entirely CoFeB when moved beneath the MgO is wrong.

Parkin’s Fig. 11 (annotated below) shows Fig. 3A’s device “*inverted*” so that the storage ... electrode is formed beneath” the MgO. *Parkin*, 22:29-33. In Fig. 11, *Parkin* adds **crystalline CoFe(001) layer 520** to storage electrode 510 to serve as a templating layer for forming **MgO(001) 540** using the ’835-Application’s method. *Parkin*, 22:66-23:11.

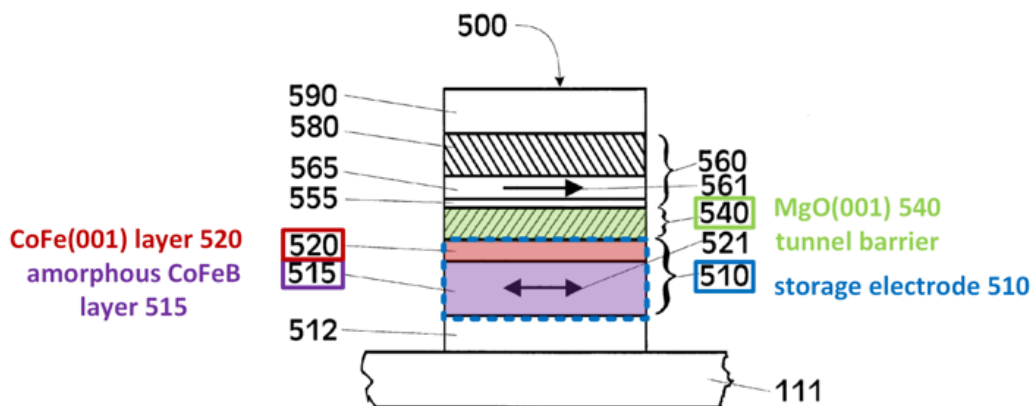


FIG. 11

Both experts refute Petitioner’s (mis)reading of Parkin’s “inverted” Fig. 3A. EX2085, 43:24-44:10 (*Bokor* admitted: “in that sentence [Parkin] is not describing the composition of the layers”), 42:8-43:9, 44:15-45:24; EX1101, 159:4-9 (Parkin “merely says the device may be inverted. It doesn’t give any further details”), 160:18-161:5 (“we don’t know which of the layers are actually flipped”). *Bokor* conceded he found no disclosure in Parkin of forming MgO(001) on amorphous CoFeB other than a *different* disclosure discussed *infra* §V.B.3 about Fig. 11’s interface layer 520 allegedly being “optional.” EX2085, 117:15-120:4.⁴

Petitioner’s “waive[r]” argument is extraordinary. Reply, 3. As the Board recognized, the POPR made no argument about the MgO(001) limitations. DI, 14

⁴ Even if Parkin were (mis)read as saying inverted Fig. 3A’s MgO is formed on amorphous CoFeB, Parkin never says MgO(001) would form and POSAs would not have expected the MgO barrier to be crystalline(001). EX1101, 157:15-161:20.

(1[d]); POR, 4 (n. 1). The POPR argument Petitioner misleadingly cites was for *different* limitations—1[e]/3[e]—relating to crystallized CoFeB. The Petition never argued that Parkin’s inverted Fig. 3A teaches forming MgO(001) on amorphous CoFeB (*supra* §IV addressing Petition’s arguments), so the POR could not have responded.

3. Petitioner Mischaracterizes Parkin’s Fig. 11

The Petition never cited Parkin Fig. 11, let alone argued that its “‘interface layer 520’ is optional” (Reply, 4) which allegedly meets the MgO(001) limitations. *Supra* §IV (Petition’s arguments). That new argument should not be considered and fails if it is.

Fig. 11’s storage electrode 510 has **amorphous CoFeB layer 515** and a crystalline(001) **Co₇₀Fe₃₀ interface layer 520** formed thereon. EX1062, 22:56-23:1. “**MgO tunnel barrier 540** is then formed according to the methods described in” EX2080 (’835-Application) and EX2081(“’246-Application”) that form MgO(001) on a crystalline(001) layer like **interface layer 520**. EX1062, 23:5-11; EX2080, 35:12-18; EX2081, 91:5-21; Fig. 11 (annotated below).

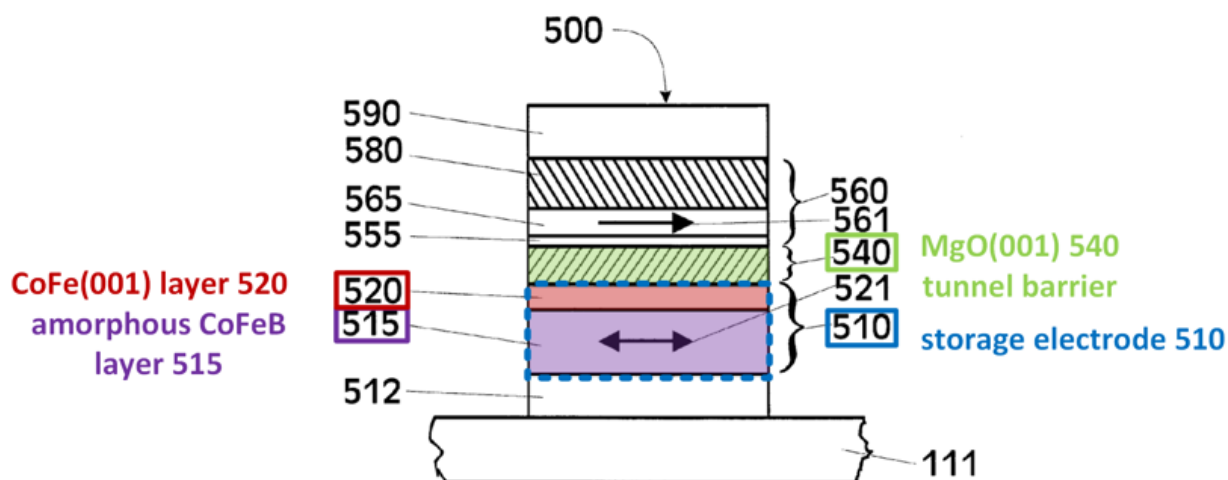


FIG. 11

Petitioner says Parkin forms MgO(001) on amorphous CoFeB because “‘interface layer 520’ is optional.” Reply, 4; EX2085, 117:15-120:4 (Bokor admitted that is the *only support* for his opinion that Parkin discloses MgO(001) on CoFeB). That fails for multiple reasons.

First, Parkin’s disclosure that “[a]n interface layer 520 *of* a crystalline *CoFe* alloy may be used” (Parkin, 22:66-67) does not say **interface layer 520** is “optional.” It says **interface layer 520** “may be” CoFe. Stating **interface layer 520** “may be” *CoFe* comports with Parkin’s disclosure that another crystalline(001) layer “may be formed from *Co₇₀Fe₃₀*” (*id.*, 13:10-13). Parkin’s teaching that the crystalline(001) layer can be “formed from” different crystalline(001) materials never says **interface layer 520** is optional. EX2085, 52:3-20 (Bokor conceded POSAs could read Parkin as saying “an interface layer of something else may also be used”); 53:3-14 (similar).

Second, Petitioner's (mis)reading is inconsistent with Parkin's teaching that Fig. 11's MgO(001) is formed using the methods in EX2080-EX2081 (Parkin, 23:6-11) which ***Parkin itself*** says form MgO on a crystalline(001) layer (Parkin, 3:24-41). *Supra* §V.B.1 (EX2080 citations); EX2081, 91:5-21. Bokor admits Parkin says Fig. 11's MgO is made using the '835-Application's method that employs a crystalline(001) layer (EX2085, 107:8-108:4) and could not identify any disclosure in the '835-Application of forming MgO(001) on amorphous CoFeB (EX2085, 55:1-75:21, 100:21-108:4. The Reply and Bokor's declarations ignored the '835- and '246-Applications, which are dispositive of how Parkin says Fig. 11's MgO(001) layer is formed and refute Petitioner's assertion that Parkin formed MgO(001) on amorphous CoFeB.

Third, multiple publications acknowledge Parkin's well-known work yet attribute discovery of MgO(001) formation on amorphous CoFeB to Yuasa. *Infra* §VI. No one has ever interpreted Parkin the way Petitioner does despite Parkin's work having been cited over 4,000 times. *Id.*

C. No Prior Art Reference Formed MgO(001) on CoFeB

Bokor said Parkin Fig. 11 was the ***sole*** basis for his opinion that it was known to form an MgO(001) barrier on amorphous CoFeB. EX2085, 95:7-97:1 ("I don't have any other examples"), 114:17-23, 117:15-120:4. Given Parkin's disclosure that Fig. 11's MgO(001) was formed using a crystalline(001) layer to

promote MgO(001) formation (*supra* §V.B.3; EX2053 ¶¶104-107), Petitioner failed to identify any prior art teaching an MgO(001) barrier formed on amorphous CoFeB.

D. Petitioner’s New Argument that MgO Formation on Other Amorphous Substrates Provided a Reasonable Expectation of Success in Forming an MgO(001) Barrier on CoFeB Fails

The Reply’s argument that evidence of MgO(001) forming on other amorphous materials provided a reasonable expectation of success in forming MgO(001) on amorphous CoFeB (Reply, 6-8, 12-16) was not in the Petition (*supra* §§I, IV) and should not be considered. If considered, this argument fails.

1. Petitioner’s Argument Rests on Unreliable Bokor Testimony

It is undisputed that no *prior art reference* teaches that MgO(001) formation on another amorphous material was predictive of MgO(001) formation on amorphous CoFeB. The only evidence Petitioner cites to purportedly link its new evidence to a reasonable expectation of success in forming MgO(001) on amorphous CoFeB is Bokor’s naked say-so. Bokor is woefully unqualified to offer that opinion. Bokor admitted MgO crystal formation “is very complicated” (*supra* §IV.C) and he is *not a crystal growth expert* (*supra* §V.A).

In contrast, Petitioner never disputed that Ross is a world-leading expert in “materials science, thin film growth and crystal growth.” POR, 1 (citing EX2053, ¶¶2-10). Ross is unequivocal that POSAs would *not* have expected an MgO(001)

barrier to form on amorphous CoFeB before Yuasa unexpectedly showed it could be done and her testimony extensively cites corroborating evidence. EX2053, ¶¶97-99, 106-171, 255-276; POR, 36-43 and 60-71.

Ross explained why Petitioner's art disclosing crystalizing MgO on SiO₂ was not predictive of MgO crystallization on CoFeB. EX2053 ¶¶137-172. "MgO nucleation and grain growth *depended crucially* on multiple factors including" the substrate material. *Id.*, ¶156; POR, 39. Bokor agreed (EX2085, 154:13-155:2, 178:3-179:4) and admitted crystal growth depends "*crucially on the material of the substrate*" (*id.*, 154:13-155:2), on the "*surface energy of the substrate*" (*id.*, 158:8-18), and other parameters (*id.*, 152:17-158:18).

Bokor has a "*limited* understanding" of these parameters impacting crystal formation. EX2085, 156:23-157:11. In opining that POSAs would have reasonably expected MgO(001) to form on amorphous CoFeB, he did "not undertake[] a detailed analysis of the mechanism involved and all the different parameters" (*id.*, 152:17-153:15) and admitted he did not even *understand* many of the factors (*id.*, 185:10-186:3). Bokor conceded he did not consider the impact that *a different material, i.e., amorphous CoFeB*, would have had on the crystallization of MgO. *Id.*, 179:7-22, 176:10-178:4, 172:7-176:23 (admitting he did not even know what kind of bond MgO would form with CoFeB).

Bokor said it would take a “rather *extensive independent study* [to] answer questions about the precise mechanisms for the *formation of the highly oriented MgO on any particular surface*” like amorphous CoFeB. *Id.*, 153:2-15. Bokor did not do that “independent study.” Instead, his “analysis” was limited to citing “references that said that results obtained [] in that particular study indicated that [MgO(001)] would grow on *any* amorphous surface. And [CoFeB] falls within the category of any amorphous surface.” EX2085:180:22-181:7; 176:25-177:19 (similar).

As detailed below, no prior art reference says MgO(001) “would grow on *any* amorphous surface.” Bokor *assumed* MgO(001) would grow on CoFeB if it grew on other amorphous surfaces and he lacked the expertise to offer that erroneous opinion.

Below, IPB addresses additional problems with Petitioner’s references purportedly disclosing MgO(001) on various amorphous substrates. IPB has no Ross testimony on EX1097-EX1099⁵ because IPB’s sur-reply declaration request was denied. Paper 30. But Ross’s testimony explaining why other references do

⁵ Petitioner incredibly criticizes Ross for “refus[ing]” to address these exhibits.

Reply, 6-7. If they were in the Petition she would have. Expecting Ross to opine on references sprung on her at deposition is unreasonable.

not inform MgO formation on CoFeB, Bokor's admissions, and the references themselves demonstrate why Petitioner's new "other substrate" argument fails.

2. No Evidence Teaches that MgO(001) Forms on All Amorphous Substrates

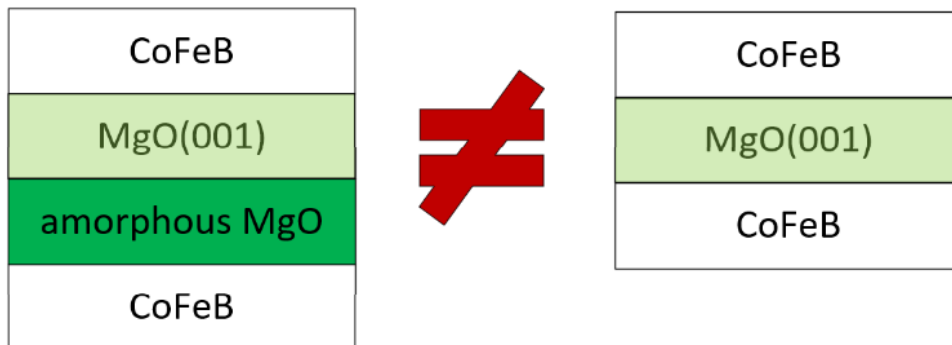
Petitioner says Nagahama, APL (EX2006), Nature (EX2008), Wulff (EX1036), and Tonouchi (EX1099), teach that MgO(001) forms on *any amorphous substrate* and thereby implicitly teach that MgO(001) would form on amorphous CoFeB. Reply, 6-8. These references *refute* Petitioner's argument.

a. MgO Seed Layers Are Not MgO(001) Barriers

Nagahama: Petitioner cites Fig. 12's MgO "double underlayer" (202-203) on which Nagahama builds its MTJ (205) that Ground 2 relies on and calls layers 202-203 "*seed* layers." Reply, 6; Ross, ¶¶188-189; POR, 45-46. *Seed* layers 202-203 are not Nagahama's MgO *barrier* the Petition mapped to the MgO(001) limitations. Petition, 56; EX1105, ¶13 (Bokor admitted an "MgO(001) *seed* layer is not a tunnel *barrier*"). Nagahama's MgO(001) *barrier* is formed on a crystalline(001) layer (EX1027, ¶73) – not on an amorphous layer.

In Nagahama's Fig. 12, Petitioner concedes MgO seed layer 202 is *amorphous* at its interface with amorphous substrate 201 and only layer 203 away from the substrate 201 crystallizes. Reply, 6; EX1027, [0056]-[0059]. This corroborates Ross's explanation that MgO is expected to have a non-crystalline

random orientation at its interface with an amorphous layer and crystallizes only at thicknesses away from the amorphous layer. EX2053, ¶¶188-189, 149-162.



To act as an MTJ *barrier*, MgO must be crystallized at its interfaces with *both* electrodes. EX2085, 123:18-124:5 (*Bokor* admitted) ⁶; EX1046, 4. Petitioner alleged the MgO(001) limitations were met by Butler's/Nagahama's barriers that are MgO(001) at their electrode interfaces. Petition, 30 (Bowen), 56 (Nagahama). If MgO formed on a CoFeB electrode the way Nagahama's seed layers formed (with an *amorphous* MgO layer 202 on the amorphous undersurface), that would not yield the structure Petitioner mapped to the MgO(001) limitations. Thus, Nagahama's *seed layers refute* Petitioner's assertion that POSAs would have reasonably expected success in forming an MgO(001) *barrier* on amorphous CoFeB in Petitioner's combinations.

⁶ IPB has no Ross testimony because the argument that *seed* layers inform growing MgO(001) *barrier* layers is new.

Yuasa Nature Materials (EX2008)/Inaba (EX1098): EX2008

characterizes Inaba as teaching that Fe(001)/MgO(001)/Fe(001) MTJs can be prepared on any substrate using an “**MgO(001) seed layer**.” EX2008, 870; Reply, 8. Like Nagahama, Inaba says MgO has no crystal structure at its interface with an amorphous underlayer and only becomes crystalline at thicknesses away from the interface. EX1098, 2373 (“MgO initial layer shows ***no clear crystallographic structure*** up to around a few nm from the Si substrate”). Petitioner’s reliance on Inaba’s seed layer fails for the same reasons as Nagahama’s seed layers.

b. Wulff (EX1036)/Tonouchi (EX1099)

Petitioner’s suggestion that Wulff taught forming MgO(001) on substrates beyond the three he studied – alumina, sapphire, and float glass (EX1036, 150) – is baseless. Reply, 8, 13. Wulff’s reference to MgO growth “regardless of the substrate selection” merely summarizes Tonouchi’s results (reference “8”) in the immediately-preceding sentence. EX1036, 148.

Moreover, Petitioner falsely alleges Tonouchi “confirmed MgO(100) grew ‘regardless of the substrate’” and saw “no material difference between 1- and 100-nm MgO layers.”⁷ Reply, 8. Tonouchi acknowledged the understanding (EX2053, ¶¶145-162) that sufficiently-**thick** MgO layers form crystalline(001) and

⁷ IPB’s request to have Ross address Tonouchi was denied. Paper 30.

investigated whether this “maintains at one monolayer of MgO deposition.”

EX1099, 962.

Tonouchi deposited MgO on multiple substrates. *Id.*, 962-964. Petitioner seizes on MgO(001) forming at the surface with one (SiO₂) which Tonouchi attributed to “structural surface deformation” which would be absent in a *flat* MTJ electrode. Reply, 8; EX1099, 964; EX2085, 201:4-22 (Bokor admitted Tonouchi did not understand why crystalline MgO formed in a thin layer on SiO₂), 192:19-23 (MTJ electrode must “be very flat”). Petitioner ignores Tonouchi’s teaching that MgO(001) did not form at the surface with *other substrate* materials (InP, GaAs). EX1099, 963-964. Tonouchi shows that MgO(001) formation at the interface with a substrate was *substrate-dependent* and *refutes* that MgO(001) forms “regardless of the substrate.” Reply, 8.

c. Wang-1997 (EX1097) Fails to Support Forming MgO(001) on Amorphous CoFeB

Petitioner cites Wang-1997’s disclosure of forming MgO(001) on Si₃N₄. Reply, 7; EX1097, 2955. Wang-1997 says nothing about MgO(001) forming on any other substrate. It is undisputed that MgO crystal formation depends on many factors including the substrate material. POR, 39-42; EX2053 ¶¶156-163. Tonouchi’s finding that MgO(001) formed on one amorphous substrate but *not* on others corroborates this. *Supra* §V.D.2.b.

Bokor never considered, and *did not even understand* many of, the factors impacting MgO crystal formation. *Supra* §§V.A, V.D.1. Petitioner cites no credible evidence establishing that POSAs would have expected Wang-1997's teaching for Si₃N₄ (which like Tonouchi's SiO₂ is a ceramic) to be predictive of MgO(001) forming on a very different material – CoFeB (a metal).

Moreover, Wang-1997's process is incompatible with MTJs. EX2085, 188:12-190:14, 192:19-194:8 (Bokor could not explain how Wang-1997's ion-beam-assisted deposition could form MTJs without damaging the ferromagnetic underlayer) which Bokor admitted must "be very flat" (*id.*, 192:19-23).

d. APL (EX2006)

Petitioner's contention that Yuasa's APL paper "refutes" that MgO(001) forming on CoFeB was surprising because APL cites Wang-1997's MgO(001) growth on amorphous Si₃N₄ is extraordinary. Reply, 7.

In the *same paragraph* citing Wang-1997, APL says: "**Surprisingly**, the MgO layer, grown on the amorphous CoFeB layer, showed a good crystalline structure with a (001) fiber texture." EX2006, 2. APL **confirms** Yuasa's discovery was surprising. *Infra* §VI (Petitioner never disputes this article in a **prestigious peer-reviewed journal** has been cited over 1,200 times).

e. The Evidence Refutes that MgO(001) Forms at the Interface With Any Substrate

Nagahama and Inaba taught that MgO was *amorphous/ non-crystalline* at its interface with amorphous underlayers and Tonouchi taught that MgO(001) failed to form at the interface with two substrates. *Supra* § V.D.2.a-b. This evidence refutes Petitioner’s suggestion that POSAs believed an MgO(001) barrier would grow “regardless of the substrate selection”⁸ or on *any* amorphous surface. Reply, 5-9, 13; EX2085, 180:20-181:7; 177:11-17. That erroneous *assumption* was the basis for Bokor’s opinion that POSAs would have reasonably expected MgO(001) to form on amorphous CoFeB. *Supra* § V.D.1. Bokor’s opinion thus warrants no weight. *Id.*

No prior art says MgO formation on other amorphous substrates is informative of how MgO would form on amorphous CoFeB. Petitioner’s “other substrate” argument fails because it rests entirely on Bokor’s unreliable testimony.

3. Ross’s Testimony is Corroborated and Credible

It is undisputed that Ross is a world-leading crystal growth expert. POR, 1. Despite that, Petitioner says her testimony is “unreliable” because she allegedly

⁸ Petitioner’s evidence shows MgO(001) formation at the surface with some ceramics (*supra* § V.D.2.b-c) that are not even in the same class of materials (metals) as CoFeB.

said “MgO forms *only* ‘random grain orientation’ on amorphous surfaces.” Reply, 6-7. That is incorrect. Ross testified POSAs knew MgO “would *most likely* have resulted in random grain orientation” at an amorphous surface. EX2053, ¶155. Her testimony is corroborated by extensive objective evidence (*supra* §V.D.2.a) and Petitioner’s own references (Nagahama, Inaba) teaching that MgO was amorphous/non-crystalline at its interface with an amorphous underlayer. *Supra* §V.D.2.a-b.

Petitioner criticizes Ross’s citation to Petrov’s teaching that initial crystal formation (“nucleation”) on amorphous substrates is random – not (001) – and evolves into a preferred texture only at thicknesses away from the substrate (POR, 40; EX2053, ¶¶149-162; EX2065, S118, S126) because Petrov is not specific to MgO. Reply, 9. Despite bearing the burden, Petitioner cites no evidence suggesting POSAs expected these fundamental crystal growth dynamics to *not* apply to MgO.

Indeed, Aboelfotoh (EX2067)’s findings mirror Petrov’s for MgO – MgO formed randomly on amorphous substrates and as (001) only at thicknesses away from the substrate. POR, 38-42; EX2053, ¶¶ 157-160; EX2067, 621, 623-25.

Aboelfotoh explains *why* the substrate material matters: when factors suggest a strong bond between MgO and the amorphous material surface on which it forms POSAs expected random MgO grain orientation, whereas when those factors suggest a weak bond, MgO(001) may form at the surface. EX2067, 625.

Bokor never considered Aboelfotoh's explanation, could not explain Aboelfotoh's factors and refused to answer whether applying Aboelfotoh's factors to CoFeB would lead POSAs to expect random grain formation at its surface rather than (001). EX2085, 173:13-180:4, 183:24-187:22.

Petitioner's assertion that EX1104 and "the scientific consensus regarding forming MgO(001) on amorphous substrates" override Aboelfotoh's teaching is obfuscation. Reply, 9 (*citing* EX1104 and related Bokor testimony). EX1104 **confirmed** Aboelfotoh's results because MgO layers thinner than **150 nm** were "amorphous" and only thicker layers had a (111) or (001)/(200)-orientation. EX1104, 3733.

It is undisputed that an MTJ MgO barrier is on the order of **10 nm** (EX2053, ¶122) and **must be MgO(001) at its electrode interfaces** (*supra* §V.D.2.a). MgO crystallizing at thicknesses away from an amorphous surface is irrelevant. Aboelfotoh's/EX1104's teachings that MgO was amorphous/non-crystalline at its interface with an amorphous underlayer shows POSAs would not have expected an MgO(001) **barrier** to form on an amorphous electrode. *Supra* §V.D.2.a.

VI. Secondary Considerations

A. Praise

Petitioner *never disputes* Yuasa’s industry-praised APL paper describes a CoFeB/MgO/CoFeB MTJ meeting claim 1.⁹ POR, 61-62; *Volvo v. Brunswick*, 81 F.4th 1202, 1212 (Fed. Cir. 2023) (nexus provided by claimed combination as a whole).

Park (EX2005) - Petitioner *never disputes* its employee praised Yuasa’s invention as a “practical solution to overcome” the difficulty in forming crystalline underlayers for MgO by showing MgO(001) could form on amorphous CoFeB. POR, 64-65; EX2005, 36, 39-40; EX2085, 15:2-16:21, 32:3-25 (admitting same); 28:23-31:11 (admitting Park describes claim 1), 20:10-15 (admitting Park describes and praises APL’s MTJ device as providing a practical solution to the problems EX2005 described), 12:20-13:6, 14:6-17:1, 138:22-139:15.

Gao (EX2022) - Petitioner never disputes another employee—after discussing Parkin’s work—praised the “significance” of *Yuasa’s* CoFeB/MgO/CoFeB MTJ which had “strong (001) MgO texture” formed on

⁹ Ross’s admission of no nexus for claims 3-4’s “entirely crystallized” layers is irrelevant to claim 1.

CoFeB rather than on a crystalline(001) underlayer. POR, 64-65; EX2022, 106-107, 111; EX2085, 125:7-129:11 (admitting same).

TDK (EX2023) – Petitioner never disputes TDK—after discussing Parkin’s work—praised *Yuasa’s* “novel idea[]” that formed “simple CoFeB amorphous magnetic electrodes” rather than a more complicated crystalline(001) underlayer and showed “[u]pon annealing CoFeB and MgO can be crystallized.” POR, 65; EX2023, 2; EX2085, 129:13-137:15, 138:22-139:15 (conceding this made adopting MgO MTJs “much easier” for reasons EX2023 explains).

Petitioner’s *only* response – alleging Parkin “already disclosed” CoFeB/MgO/CoFeB MTJs “rendering these references [Park, Gao and TDK] incapable of showing non-obviousness” (Reply, 26) – fails. Petitioner provides no analysis and cites no evidence supporting its assertion that Parkin teaches claim 1.¹⁰ Reply, 23-27. The Examiner disagreed. EX1005, 2-3 (Parkin considered). Parkin does not teach forming MgO(001) on amorphous CoFeB (*supra* §V.B) which Park, Gao and TDK praised Yuasa for. Gao and TDK acknowledged Parkin’s work (EX2022, 107 (ref. 9); EX2023, 2 (ref. 19)) but credited *Yuasa*, not Parkin, with forming MgO(001) on amorphous CoFeB. Parkin’s disclosure of individual claim limitations – not the claimed combination – fails to refute nexus.

¹⁰ Petitioner presented no Parkin anticipation ground.

Chemours v. Daikin, 4 F.4th 1370, 1378 (Fed. Cir. 2021) (citations omitted)

(“separate disclosure of individual limitations [in the art], where the invention is a unique combination ... does not negate a nexus.”).

B. Awards

Petitioner never disputes Yuasa received an award for “an original method of growing a crystalline layer [MgO] on an amorphous layer [CoFeB].” POR, 67 (*citing* **EX2034**, 1, **EX2035**, 1).

Bokor admitted Yuasa’s invention eliminated need for crystalline(001) underlayers and thereby enabled mass production of MgO MTJs. EX2085, 139:18-141:13, 142:25-143:8. EX2029 praised Yuasa for this contribution. POR, 66.

Petitioner’s assertion that these awards “lack nexus because [] Parkin previously disclosed MgO-CoFeB MTJs” (Reply, 26-27) fails as explained *supra* §V.B.

Petitioner’s challenge to nexus, because the ’134 Patent allegedly does not disclose or claim what these awards cover, fails. Reply, 26-27. The ’134 Patent describes the method Yuasa used to form the claimed CoFeB-MgO(001)-CoFeB MTJ. *Supra* §VI.A.

Yuasa’s awards (EX2034, EX2035, EX2029) for forming MgO(001) on amorphous CoFeB refute that POSAs would have reasonably expected success in doing so.

C. Yuasa's Surprising Results

Petitioner never disputes that EX2006 describes a CoFeB/MgO/CoFeB MTJ meeting claim 1, says “~~/s~~*surprisingly*, the MgO layer, grown on amorphous CoFeB layer, showed a good crystalline structure with a (001) fiber texture,”¹¹ that APL is a *prominent peer-reviewed* journal, nor that Yuasa's APL paper was cited over 1,200 times. POR, 26, 61-62; EX2017, 191:20-25 (admitting “prominent journal”). APL's *editors* and *peer reviewers* endorsed this result as “surprising[]” and Petitioner cites no evidence disputing that despite this paper being widely cited.

VII. Motivation to Combine

The Reply fails to meaningfully refute that POSAs would not have combined the prior art in the manner Petitioner alleges. POR, 43-59.

VIII. Claims 3-4

Petitioner's challenge to claims 3-4 falls with its challenge to claims 1-2 and also because it is unsupported by expert testimony. POR, 59-60. The Board should again reject Petitioner's argument that an allegedly-crystallized “*portion* of

¹¹ Petitioner's contention that APL “refutes” “surprise” (Reply, 7) is nonsense.

Supra §V.D.2.d.

[Parkin's] layer 175" means Parkin's layer 175 is *entirely crystallized* (Petition, 47-48). IPR2025-00701, Paper 11, 17-18.

Respectfully submitted,
GODO KAISHA IP BRIDGE I

Date: November 19, 2025

/Gerald B. Hrycyszyn/

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, the undersigned certifies that the foregoing **PATENT OWNER'S SUR-REPLY TO PETITIONER'S REPLY** contains 5,599 words excluding; a table of contents, a table of authorities, a certificate of service or word count, or appendix of exhibits or claim listing. Patent Owner has relied on the word count feature of the word processing system used to create this paper in making this certification.

Date: November 19, 2025

/Dara Del Rosario/
Dara Del Rosario
Paralegal
WOLF, GREENFIELD & SACKS, P.C.

CERTIFICATE OF SERVICE UNDER 37 C.F.R. § 42.6 (E)(4)

I certify that on November 19, 2025, a copy of the foregoing document, including any exhibits filed therewith, is being served via electronic mail, as previously consented to by Petitioner, upon the following:

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Date: November 19, 2025

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